

2053293_1.TXT

SEQUENCE LISTING



<110> Yanagi, Masayuki
Emerson, Suzanne
Bukh, Jens
Purcell, Robert

<120> CLONED GENOME OF INFECTIOUS HEPATITIS C
VIRUSES OF GENOTYPE 2a AND USES THEREOF

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<150> PCT/US00/15446

<151> 2000-06-02

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 Trp Leu Cys Tyr Leu Leu Thr Leu Gly Glu Ala Met Val Gln Glu Trp
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 Tyr Ser Thr Tyr Gly Lys Phe Leu Ala Asp Gly Gly Cys Ala Gly Gly
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 1395 1400 1405

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 Thr Phe Thr Ile Thr Thr Gln Ile Val Pro Gln Asp Ala Val Ser Arg
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 <213> Hepatitis C virus

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Ile Pro Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro Gly
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Tyr Pro Trp Pro Leu Tyr Gly Asn Glu Gly Leu Gly Trp Ala Gly Trp
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Pro	Ser	Pro	Val	Val	Val	Gly	Thr	Thr	Asp	Arg	Leu	Gly	Ala	Pro	Thr	
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Tyr	Thr	Trp	Gly	Glu	Asn	Glu	Thr	Asp	Val	Phe	Leu	Leu	Asn	Ser	Thr	
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				565					570					575		
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			580					585					590			

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 Pro Arg Cys Leu Ile Asp Tyr Pro Tyr Arg Leu Trp His Tyr Pro Cys
 610 615 620
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 625 630 635 640
 Glu His Arg Leu Thr Ala Ala Cys Asn Phe Thr Arg Gly Asp Arg Cys
 645 650 655
 Asn Leu Glu Asp Arg Asp Arg Ser Gln Leu Ser Pro Leu Leu His Ser
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 Thr Thr Glu Trp Ala Ile Leu Pro Cys Ser Tyr Ser Asp Leu Pro Ala
 675 680 685
 Leu Ser Thr Gly Leu Leu His Leu His Gln Asn Ile Val Asp Val Gln
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 Phe Met Tyr Gly Leu Ser Pro Ala Leu Thr Lys Tyr Ile Val Arg Trp
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 Glu Trp Val Ile Leu Leu Phe Leu Leu Leu Ala Asp Ala Arg Val Cys
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 Leu Val Ser Phe Leu Val Phe Phe Cys Phe Ala Trp Tyr Leu Lys Gly
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 1285 1290 1295
 Tyr Ser Thr Tyr Gly Lys Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly
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 1315 1320 1325
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Thr Gly Cys Val Val Ile Val Gly Arg Ile Val Leu Ser Gly Lys Pro
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Ala Ile Ile Pro Asp Arg Glu Val Leu Tyr Gln Glu Phe Asp Glu Met
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Glu Glu Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu
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Gln Tyr Leu Ala Gly Leu Ser Thr Leu Pro Gly Asn Pro Ala Ile Ala
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Ser Leu Met Ala Phe Thr Ala Ala Val Thr Ser Pro Leu Thr Thr Gly
1795 1800 1805
Gln Thr Leu Leu Phe Asn Ile Leu Gly Gly Trp Val Ala Ala Gln Leu
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Ala Ala Pro Gly Ala Ala Thr Ala Phe Val Gly Ala Gly Leu Ala Gly
1825 1830 1835 1840
Ala Ala Ile Gly Ser Val Gly Leu Gly Lys Val Leu Val Asp Ile Leu
1845 1850 1855
Ala Gly Tyr Gly Ala Gly Val Ala Gly Ala Leu Val Ala Phe Lys Ile
1860 1865 1870
Met Ser Gly Glu Val Pro Ser Thr Glu Asp Leu Val Asn Leu Leu Pro
1875 1880 1885
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His Tyr Val Pro Glu Ser Asp Ala Ala Arg Val Thr Ala Ile Leu
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2005 2010 2015
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 2645 2650 2655
 Ile Arg Thr Glu Glu Ala Ile Tyr Gln Cys Cys Asp Leu Asp Pro Gln
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 Ala Arg Val Ala Ile Lys Ser Leu Thr Glu Arg Leu Tyr Val Gly Gly
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 Pro Leu Thr Asn Ser Arg Gly Glu Asn Cys Gly Tyr Arg Arg Cys Arg
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 Ala Ser Gly Val Leu Thr Thr Ser Cys Gly Asn Thr Leu Thr Cys Tyr
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 Arg Tyr Ser Ala Pro Pro Gly Asp Pro Pro Gln Pro Glu Tyr Asp Leu
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 Glu Leu Ile Thr Ser Cys Ser Ser Asn Val Ser Val Ala His Asp Gly
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 Ile Pro Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro Gly
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	Asn	Gly	Ser	Trp	His	Ile	Asn	Arg	Thr	Ala	Leu	Asn	Cys	Asn	Asp	Ser
				420					425					430		
	Leu	His	Thr	Gly	Phe	Ile	Ala	Ser	Leu	Phe	Tyr	Thr	His	Ser	Phe	Asn
			435					440					445			
	Ser	Ser	Gly	Cys	Pro	Glu	Arg	Met	Ser	Ala	Cys	Arg	Ser	Ile	Glu	Ala
		450					455					460				
	Phe	Arg	Val	Gly	Trp	Gly	Ala	Leu	Gln	Tyr	Glu	Asp	Asn	Val	Thr	Asn
465					470						475				480	
	Pro	Glu	Asp	Met	Arg	Pro	Tyr	Cys	Trp	His	Tyr	Pro	Pro	Arg	Gln	Cys
				485						490					495	
	Gly	Val	Val	Ser	Ala	Lys	Thr	Val	Cys	Gly	Pro	Val	Tyr	Cys	Phe	Thr
			500						505					510		
	Pro	Ser	Pro	Val	Val	Val	Gly	Thr	Thr	Asp	Arg	Leu	Gly	Ala	Pro	Thr
			515					520					525			
	Tyr	Thr	Trp	Gly	Glu	Asn	Glu	Thr	Asp	Val	Phe	Leu	Leu	Asn	Ser	Thr
						535						540				
	Arg	Pro	Pro	Leu	Gly	Ser	Trp	Phe	Gly	Cys	Thr	Trp	Met	Asn	Ser	Ser
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	Gly	Tyr	Thr	Lys	Thr	Cys	Gly	Ala	Pro	Pro	Cys	Arg	Thr	Arg	Ala	Asp
				565					570						575	
	Phe	Asn	Ala	Ser	Thr	Asp	Leu	Leu	Cys	Pro	Thr	Asp	Cys	Phe	Arg	Lys
			580						585					590		
	His	Pro	Asp	Thr	Thr	Tyr	Leu	Lys	Cys	Gly	Ser	Gly	Pro	Trp	Leu	Thr
			595					600					605			
	Pro	Arg	Cys	Leu	Ile	Asp	Tyr	Pro	Tyr	Arg	Leu	Trp	His	Tyr	Pro	Cys
		610					615					620				
	Thr	Val	Asn	Tyr	Thr	Ile	Phe	Lys	Ile	Arg	Met	Tyr	Val	Gly	Gly	Val
625					630						635				640	
	Glu	His	Arg	Leu	Thr	Ala	Ala	Cys	Asn	Phe	Thr	Arg	Gly	Asp	Arg	Cys
				645						650				655		
	Asn	Leu	Glu	Asp	Arg	Asp	Arg	Ser	Gln	Leu	Ser	Pro	Leu	Leu	His	Ser
			660						665					670		
	Thr	Thr	Glu	Trp	Ala	Ile	Leu	Pro	Cys	Ser	Tyr	Ser	Asp	Leu	Pro	Ala
			675					680					685			
	Leu	Ser	Thr	Gly	Leu	Leu	His	Leu	His	Gln	Asn	Ile	Val	Asp	Val	Gln
		690					695					700				
	Phe	Met	Tyr	Gly	Leu	Ser	Pro	Ala	Leu	Thr	Lys	Tyr	Ile	Val	Arg	Trp
705					710						715				720	
	Glu	Trp	Val	Ile	Leu	Phe	Leu	Leu	Leu	Ala	Asp	Ala	Arg	Val	Cys	
				725					730					735		
	Ala	Cys	Leu	Trp	Met	Leu	Ile	Leu	Leu	Gly	Gln	Ala	Glu	Ala	Ala	Leu
			740					745					750			
	Glu	Asn	Leu	Val	Ile	Leu	Asn	Ala	Ala	Ser	Leu	Ala	Gly	Thr	His	Gly
		755						760					765			
	Leu	Val	Ser	Phe	Leu	Val	Phe	Cys	Phe	Ala	Trp	Tyr	Leu	Lys	Gly	
		770					775				780					
	Arg	Trp	Val	Pro	Gly	Ala	Val	Tyr	Ala	Leu	Tyr	Gly	Met	Trp	Pro	Leu
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Leu Leu Leu Leu Leu Ala Leu Pro Gln Arg Ala Tyr Ala Leu Asp Thr
 805 810 815
 Glu Val Ala Ala Ser Cys Gly Gly Val Val Leu Val Gly Leu Met Ala
 820 825 830
 Leu Thr Leu Ser Pro Tyr Tyr Lys Arg Tyr Ile Ser Trp Cys Met Trp
 835 840 845
 Trp Leu Gln Tyr Phe Leu Thr Arg Val Glu Ala Gln Leu His Val Trp
 850 855 860
 Val Pro Pro Leu Asn Val Arg Gly Gly Arg Asp Ala Val Ile Leu Leu
 865 870 875 880
 Met Cys Val Val His Pro Thr Leu Val Phe Asp Ile Thr Lys Leu Leu
 885 890 895
 Leu Ala Ile Phe Gly Pro Leu Trp Ile Leu Gln Ala Ser Leu Leu Lys
 900 905 910
 Val Pro Tyr Phe Val Arg Val Gln Gly Leu Leu Arg Ile Cys Ala Leu
 915 920 925
 Ala Arg Lys Ile Ala Gly Gly His Tyr Val Gln Met Ala Ile Ile Lys
 930 935 940
 Leu Gly Ala Leu Thr Gly Thr Tyr Val Tyr Asn His Leu Thr Pro Leu
 945 950 955 960
 Arg Asp Trp Ala His Asn Gly Leu Arg Asp Leu Ala Val Ala Val Glu
 965 970 975
 Pro Val Val Phe Ser Arg Met Glu Thr Lys Leu Ile Thr Trp Gly Ala
 980 985 990
 Asp Thr Ala Ala Cys Gly Asp Ile Ile Asn Gly Leu Pro Val Ser Ala
 995 1000 1005
 Arg Arg Gly Gln Glu Ile Leu Leu Gly Pro Ala Asp Gly Met Val Ser
 1010 1015 1020
 Lys Gly Trp Arg Leu Leu Ala Pro Ile Thr Ala Tyr Ala Gln Gln Thr
 1025 1030 1035 1040
 Arg Gly Leu Leu Gly Cys Ile Ile Thr Ser Leu Thr Gly Arg Asp Lys
 1045 1050 1055
 Asn Gln Val Glu Gly Glu Val Gln Ile Val Ser Thr Ala Thr Gln Thr
 1060 1065 1070
 Phe Leu Ala Thr Cys Ile Asn Gly Val Cys Trp Thr Val Tyr His Gly
 1075 1080 1085
 Ala Gly Thr Arg Thr Ile Ala Ser Pro Lys Gly Pro Val Ile Gln Met
 1090 1095 1100
 Tyr Thr Asn Val Asp Gln Asp Leu Val Gly Trp Pro Ala Pro Gln Gly
 1105 1110 1115 1120
 Ser Arg Ser Leu Thr Pro Cys Thr Cys Gly Ser Ser Asp Leu Tyr Leu
 1125 1130 1135
 Val Thr Arg His Ala Asp Val Ile Pro Val Arg Arg Arg Gly Asp Ser
 1140 1145 1150
 Arg Gly Ser Leu Leu Ser Pro Arg Pro Ile Ser Tyr Leu Lys Gly Ser
 1155 1160 1165
 Ser Gly Gly Pro Leu Leu Cys Pro Ala Gly His Ala Val Gly Leu Phe
 1170 1175 1180
 Arg Ala Ala Val Cys Thr Arg Gly Val Ala Lys Ala Val Asp Phe Ile
 1185 1190 1195 1200
 Pro Val Glu Asn Leu Gly Thr Thr Met Arg Ser Pro Val Phe Thr Asp
 1205 1210 1215
 Asn Ser Ser Pro Pro Ala Val Pro Gln Ser Phe Gln Val Ala His Leu
 1220 1225 1230
 His Ala Pro Thr Gly Ser Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr
 1235 1240 1245
 Ala Ala Gln Gly Tyr Lys Val Leu Val Leu Asn Pro Ser Val Ala Ala
 1250 1255 1260
 Thr Leu Gly Phe Gly Ala Tyr Met Ser Lys Ala His Gly Val Asp Pro
 1265 1270 1275 1280
 Asn Ile Arg Thr Gly Val Arg Thr Ile Thr Thr Gly Ser Pro Ile Thr
 1285 1290 1295
 Tyr Ser Thr Tyr Gly Lys Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly

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 Ala Tyr Asp Ile Ile Ile Cys Asp Glu Cys His Ser Thr Asp Ala Thr
 1315 1320 1325
 Ser Ile Leu Gly Ile Gly Thr Val Leu Asp Gln Ala Glu Thr Ala Gly
 1330 1335 1340
 Ala Arg Leu Val Val Leu Ala Thr Ala Thr Pro Pro Gly Ser Val Thr
 1345 1350 1355 1360
 Val Ser His Pro Asn Ile Glu Glu Val Ala Leu Ser Thr Thr Gly Glu
 1365 1370 1375
 Ile Pro Phe Tyr Gly Lys Ala Ile Pro Leu Glu Val Ile Lys Gly Gly
 1380 1385 1390
 Arg His Leu Ile Phe Cys His Ser Lys Lys Lys Cys Asp Glu Leu Ala
 1395 1400 1405
 Ala Lys Leu Val Ala Leu Gly Ile Asn Ala Val Ala Tyr Tyr Arg Gly
 1410 1415 1420
 Leu Asp Val Ser Val Ile Pro Thr Ser Gly Asp Val Val Val Ser
 1425 1430 1435 1440
 Thr Asp Ala Leu Met Thr Gly Phe Thr Gly Asp Phe Asp Ser Val Ile
 1445 1450 1455
 Asp Cys Asn Thr Cys Val Thr Gln Thr Val Asp Phe Ser Leu Asp Pro
 1460 1465 1470
 Thr Phe Thr Ile Glu Thr Thr Thr Leu Pro Gln Asp Ala Val Ser Arg
 1475 1480 1485
 Thr Gln Arg Arg Gly Arg Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg
 1490 1495 1500
 Phe Val Ala Pro Gly Glu Arg Pro Ser Gly Met Phe Asp Ser Ser Val
 1505 1510 1515 1520
 Leu Cys Glu Cys Tyr Asp Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro
 1525 1530 1535
 Ala Glu Thr Thr Val Arg Leu Arg Ala Tyr Met Asn Thr Pro Gly Leu
 1540 1545 1550
 Pro Val Cys Gln Asp His Leu Glu Phe Trp Glu Gly Val Phe Thr Gly
 1555 1560 1565
 Leu Thr His Ile Asp Ala His Phe Leu Ser Gln Thr Lys Gln Ser Gly
 1570 1575 1580
 Glu Asn Phe Pro Tyr Leu Val Ala Tyr Gln Ala Thr Val Cys Ala Arg
 1585 1590 1595 1600
 Ala Gln Ala Pro Pro Ser Trp Asp Gln Met Trp Lys Cys Leu Ile
 1605 1610 1615
 Arg Leu Lys Pro Thr Leu His Gly Pro Thr Pro Leu Leu Tyr Arg Leu
 1620 1625 1630
 Gly Ala Val Gln Asn Glu Val Thr Leu Thr His Pro Ile Thr Lys Tyr
 1635 1640 1645
 Ile Met Thr Cys Met Ser Ala Asp Leu Glu Val Val Thr Ser Thr Trp
 1650 1655 1660
 Val Leu Val Gly Gly Val Leu Ala Ala Leu Ala Ala Tyr Cys Leu Ser
 1665 1670 1675 1680
 Thr Gly Cys Val Val Ile Val Gly Arg Ile Val Leu Ser Gly Lys Pro
 1685 1690 1695
 Ala Ile Ile Pro Asp Arg Glu Val Leu Tyr Gln Glu Phe Asp Glu Met
 1700 1705 1710
 Glu Glu Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu
 1715 1720 1725
 Ala Glu Gln Phe Lys Gln Lys Ala Leu Gly Leu Leu Gln Thr Ala Ser
 1730 1735 1740
 Arg His Ala Glu Val Ile Thr Pro Ala Val Gln Thr Asn Trp Gln Lys
 1745 1750 1755 1760
 Leu Glu Val Phe Trp Ala Lys His Met Trp Asn Phe Ile Ser Gly Ile
 1765 1770 1775
 Gln Tyr Leu Ala Gly Leu Ser Thr Leu Pro Gly Asn Pro Ala Ile Ala
 1780 1785 1790
 Ser Leu Met Ala Phe Thr Ala Ala Val Thr Ser Pro Leu Thr Thr Gly
 1795 1800 1805

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Gln Thr Leu Leu Phe Asn Ile Leu Gly Gly Trp Val Ala Ala Gln Leu
 1810 1815 1820
 Ala Ala Pro Gly Ala Ala Thr Ala Phe Val Gly Ala Gly Leu Ala Gly
 1825 1830 1835 1840
 Ala Ala Ile Gly Ser Val Gly Leu Gly Lys Val Leu Val Asp Ile Leu
 1845 1850 1855
 Ala Gly Tyr Gly Ala Gly Val Ala Gly Ala Leu Val Ala Phe Lys Ile
 1860 1865 1870
 Met Ser Gly Glu Val Pro Ser Thr Glu Asp Leu Val Asn Leu Leu Pro
 1875 1880 1885
 Ala Ile Leu Ser Pro Gly Ala Leu Val Val Gly Val Val Cys Ala Ala
 1890 1895 1900
 Ile Leu Arg Arg His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met
 1905 1910 1915 1920
 Asn Arg Leu Ile Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr
 1925 1930 1935
 His Tyr Val Pro Glu Ser Asp Ala Ala Ala Arg Val Thr Ala Ile Leu
 1940 1945 1950
 Ser Ser Leu Thr Val Thr Gln Leu Leu Arg Arg Leu His Gln Trp Ile
 1955 1960 1965
 Ser Ser Glu Cys Thr Thr Pro Cys Ser Gly Ser Trp Leu Arg Asp Ile
 1970 1975 1980
 Trp Asp Trp Ile Cys Glu Val Leu Ser Asp Phe Lys Thr Trp Leu Lys
 1985 1990 1995 2000
 Ala Lys Leu Met Pro Gln Leu Pro Gly Ile Pro Phe Val Ser Cys Gln
 2005 2010 2015
 Arg Gly Tyr Arg Gly Val Trp Arg Gly Asp Gly Ile Met His Thr Arg
 2020 2025 2030
 Cys His Cys Gly Ala Glu Ile Thr Gly His Val Lys Asn Gly Thr Met
 2035 2040 2045
 Arg Ile Val Gly Pro Arg Thr Cys Arg Asn Met Trp Ser Gly Thr Phe
 2050 2055 2060
 Pro Ile Asn Ala Tyr Thr Thr Gly Pro Cys Thr Pro Leu Pro Ala Pro
 2065 2070 2075 2080
 Asn Tyr Lys Phe Ala Leu Trp Arg Val Ser Ala Glu Glu Tyr Val Glu
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 Ile Arg Arg Val Gly Asp Phe His Tyr Val Ser Gly Met Thr Thr Asp
 2100 2105 2110
 Asn Leu Lys Cys Pro Cys Gln Ile Pro Ser Pro Glu Phe Phe Thr Glu
 2115 2120 2125
 Leu Asp Gly Val Arg Leu His Arg Phe Ala Pro Pro Cys Lys Pro Leu
 2130 2135 2140
 Leu Arg Glu Glu Val Ser Phe Arg Val Gly Leu His Glu Tyr Pro Val
 2145 2150 2155 2160
 Gly Ser Gln Leu Pro Cys Glu Pro Glu Pro Asp Val Ala Val Leu Thr
 2165 2170 2175
 Ser Met Leu Thr Asp Pro Ser His Ile Thr Ala Glu Ala Ala Gly Arg
 2180 2185 2190
 Arg Leu Ala Arg Gly Ser Pro Pro Ser Met Ala Ser Ser Ala Ser
 2195 2200 2205
 Gln Leu Ser Ala Pro Ser Leu Lys Ala Thr Cys Thr Ala Asn His Asp
 2210 2215 2220
 Ser Pro Asp Ala Glu Ile Glu Ala Asn Leu Leu Trp Arg Gln Glu
 2225 2230 2235 2240
 Met Gly Gly Asn Ile Thr Arg Val Glu Ser Glu Asn Lys Val Val Ile
 2245 2250 2255
 Leu Asp Ser Phe Asp Pro Leu Val Ala Glu Glu Asp Glu Arg Glu Val
 2260 2265 2270
 Ser Val Pro Ala Glu Ile Leu Arg Lys Ser Arg Arg Phe Ala Arg Ala
 2275 2280 2285
 Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr
 2290 2295 2300
 Trp Lys Lys Pro Asp Tyr Glu Pro Pro Val Val His Gly Cys Pro Leu

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Val	Val	Leu	Thr	Glu	Ser	Thr	Leu	Ser	Thr	Ala	Leu	Ala	Glu
				2340					2345				2350
Thr	Lys	Ser	Phe	Gly	Ser	Ser	Ser	Thr	Ser	Gly	Ile	Thr	Gly
		2355						2360				2365	
Thr	Thr	Thr	Ser	Ser	Glu	Pro	Ala	Pro	Ser	Gly	Cys	Pro	Pro
	2370					2375					2380		
Asp	Val	Glu	Ser	Tyr	Ser	Ser	Met	Pro	Pro	Leu	Glu	Gly	Glu
2385					2390					2395			2400
Asp	Pro	Asp	Leu	Ser	Asp	Gly	Ser	Trp	Ser	Thr	Val	Ser	Ser
				2405					2410				2415
Asp	Thr	Glu	Asp	Val	Val	Cys	Cys	Ser	Met	Ser	Tyr	Ser	Trp
			2420					2425					2430
Ala	Leu	Val	Thr	Pro	Cys	Ala	Ala	Glu	Glu	Gln	Lys	Leu	Pro
	2435						2440					2445	
Ala	Leu	Ser	Asn	Ser	Leu	Leu	Arg	His	His	Asn	Leu	Val	Tyr
	2450						2455				2460		
Thr	Ser	Arg	Ser	Ala	Cys	Gln	Arg	Gln	Lys	Lys	Val	Thr	Phe
2465					2470					2475			2480
Leu	Gln	Val	Leu	Asp	Ser	His	Tyr	Gln	Asp	Val	Leu	Lys	Glu
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Ala	Ala	Ala	Ser	Lys	Val	Lys	Ala	Asn	Leu	Leu	Ser	Val	Glu
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Cys	Ser	Leu	Thr	Pro	Pro	His	Ser	Ala	Lys	Ser	Lys	Phe	Gly
	2515						2520					2525	
Ala	Lys	Asp	Val	Arg	Cys	His	Ala	Arg	Lys	Ala	Val	Ala	His
	2530					2535					2540		
Ser	Val	Trp	Lys	Asp	Leu	Leu	Glu	Asp	Ser	Val	Thr	Pro	Ile
2545					2550				2555				2560
Thr	Ile	Met	Ala	Lys	Asn	Glu	Val	Phe	Cys	Val	Gln	Pro	Glu
			2565					2570					2575
Gly	Arg	Lys	Pro	Ala	Arg	Leu	Ile	Val	Phe	Pro	Asp	Leu	Gly
			2580					2585					2590
Val	Cys	Glu	Lys	Met	Ala	Leu	Tyr	Asp	Val	Val	Ser	Lys	Leu
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Ala	Val	Met	Gly	Ser	Ser	Tyr	Gly	Phe	Gln	Tyr	Ser	Pro	Gly
	2610					2615					2620		
Val	Glu	Phe	Leu	Val	Gln	Ala	Trp	Lys	Ser	Lys	Lys	Thr	Pro
2625					2630					2635			2640
Phe	Ser	Tyr	Asp	Thr	Arg	Cys	Phe	Asp	Ser	Thr	Val	Thr	Glu
			2645					2650					2655
Ile	Arg	Thr	Glu	Ala	Ile	Tyr	Gln	Cys	Cys	Asp	Leu	Asp	Pro
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	2675						2680					2685	
Pro	Leu	Thr	Asn	Ser	Arg	Gly	Glu	Asn	Cys	Gly	Tyr	Arg	Arg
	2690					2695					2700		
Ala	Ser	Gly	Val	Leu	Thr	Thr	Ser	Cys	Gly	Asn	Thr	Leu	Thr
2705					2710					2715			2720
Ile	Lys	Ala	Arg	Ala	Ala	Cys	Arg	Ala	Ala	Gly	Leu	Gln	Asp
			2725					2730					2735
Met	Leu	Val	Cys	Gly	Asp	Asp	Leu	Val	Val	Ile	Cys	Glu	Ser
			2740					2745				2750	
Val	Gln	Glu	Asp	Ala	Ala	Ser	Leu	Arg	Ala	Phe	Thr	Glu	Ala
	2755						2760					2765	
Arg	Tyr	Ser	Ala	Pro	Pro	Gly	Asp	Pro	Pro	Gln	Pro	Glu	Tyr
	2770					2775					2780		
Glu	Leu	Ile	Thr	Ser	Cys	Ser	Ser	Asn	Val	Ser	Val	Ala	His
2785					2790					2795			2800
Ala	Gly	Lys	Arg	Val	Tyr	Tyr	Leu	Thr	Arg	Asp	Pro	Thr	Thr
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 Leu Gly Asn Ile Ile Met Phe Ala Pro Thr Leu Trp Ala Arg Met Ile
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 Leu Met Thr His Phe Phe Ser Val Leu Ile Ala Arg Asp Gln Leu Glu
 2850 2855 2860
 Gln Ala Leu Asn Cys Glu Ile Tyr Gly Ala Cys Tyr Ser Ile Glu Pro
 2865 2870 2875 2880
 Leu Asp Leu Pro Pro Ile Ile Gln Arg Leu His Gly Leu Ser Ala Phe
 2885 2890 2895
 Ser Leu His Ser Tyr Ser Pro Gly Glu Ile Asn Arg Val Ala Ala Cys
 2900 2905 2910
 Leu Arg Lys Leu Gly Val Pro Pro Leu Arg Ala Trp Arg His Arg Ala
 2915 2920 2925
 Arg Ser Val Arg Ala Arg Leu Ser Arg Gly Gly Arg Ala Ala Ile
 2930 2935 2940
 Cys Gly Lys Tyr Leu Phe Asn Trp Ala Val Arg Thr Lys Leu Lys Leu
 2945 2950 2955 2960
 Thr Pro Ile Ala Ala Ala Gly Arg Leu Asp Leu Ser Gly Trp Phe Thr
 2965 2970 2975
 Ala Gly Tyr Ser Gly Gly Asp Ile Tyr His Ser Val Ser His Ala Arg
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 Ile Tyr Leu Leu Pro Asn Arg
 3010 3015

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<220>

<223> synthetic oligonucleotide

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<212> DNA

<213> Artificial Sequence

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24

<210> 38
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 acggaccttt cacagctagc cgtgactagg gctaagatgg agccacc 107

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 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
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 <211> 45
 <212> PRT
 <213> Hepatitis c virus

<400> 40
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 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 41
 <211> 45
 <212> PRT
 <213> Hepatitis C virus

<400> 41
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 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 42
 <211> 45
 <212> PRT
 <213> Hepatitis C virus

<400> 42
 Leu Leu Leu Ala Ala Gly Val Asp Ala Arg Thr His Thr Val Gly Gly
 1 5 10 15
 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 43
 <211> 45
 <212> PRT
 <213> Hepatitis C virus

<400> 43
 Leu Leu Leu Ala Ala Gly Val Asp Ala Arg Thr His Thr Val Gly Gly
 1 5 10 15
 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 44
 <211> 45
 <212> PRT
 <213> Hepatitis C virus

<400> 44
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 35 40 45

<210> 45
 <211> 45
 <212> PRT
 <213> Hepatitis C virus

<400> 45
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 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 46
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 <212> PRT
 <213> Hepatitis C virus

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<400> 46

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 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
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<210> 47

<211> 45

<212> PRT

<213> Artificial Sequence

<220>

<223> consensus sequence

<400> 47

Leu Leu Leu Ala Ala Gly Val Asp Ala Arg Thr His Thr Val Gly Gly
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 Ser Ala Ala Gln Thr Thr Gly Arg Leu Thr Ser Leu Phe Asp Met Gly
 20 25 30
 Pro Arg Gln Lys Ile Gln Leu Val Asn Thr Asn Gly Ser
 35 40 45

<210> 48

<211> 45

<212> PRT

<213> Hepatitis C virus

<400> 48

Leu Leu Leu Ala Ala Gly Val Asp Ala Gln Thr His Thr Val Gly Gly
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 Ser Thr Ala His Asn Ala Arg Thr Leu Thr Gly Met Phe Ser Leu Gly
 20 25 30
 Ala Arg Gln Lys Ile Gln Leu Ile Asn Thr Asn Gly Ser
 35 40 45

<210> 49

<211> 360

<212> DNA

<213> Hepatitis C virus

<400> 49

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gcaagactgc	tagccgagta	gtgttggtgc	gcgaaaggcc	ttgtggtact	gcctgatagg	300
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<211> 360

<212> DNA

<213> Hepatitis C virus

<400> 50

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ccccctccc	gggagagcca	tagtggtctg	cggaaaccgt	gagtacaccg	gaattgccag	180

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gcaagactgc tagccgagta gcgttgggtt gcgaaaggcc ttgtggtact gcctgatagg 300
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<210> 51
<211> 360
<212> DNA
<213> Hepatitis C virus

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<400> 51
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<210> 52
<211> 360
<212> DNA
<213> Hepatitis C virus

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<210> 53
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<213> Hepatitis C virus

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<211> 359
<212> DNA
<213> Hepatitis C virus

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<210> 55
<211> 225
<212> DNA

<213> Hepatitis C virus

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<400> 55
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yyyyyyyyyy yyyyyyyyyy yyyyyyyyyy yyyyyyyyyy yyyyyyyyyy yyyyyyyyyy 120
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<210> 56

<211> 225

<212> DNA

<213> Hepatitis C virus

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<400> 56
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<210> 57

<211> 225

<212> DNA

<213> Hepatitis C virus

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<210> 58

<211> 225

<212> DNA

<213> Hepatitis C virus

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<210> 59

<211> 225

<212> DNA

<213> Hepatitis C virus

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<210> 60

<211> 272

<212> DNA

<213> hepatitis C virus

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<210> 61
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 <212> PRT
 <213> Hepatitis C virus

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 Thr His Gly Leu Val Ser Phe Leu Val Phe Phe Cys Phe Ala Trp Tyr
 35 40 45
 Leu Lys Gly Arg Trp Val Pro Gly Ala Val Tyr Ala Leu Tyr Gly Met
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 Trp Pro Leu Leu Leu Leu Leu Leu Ala Leu Pro Gln Arg Ala Tyr Ala
 65 70 75 80
 Leu Asp Thr Glu Val Ala Ala Ser Cys Gly Gly Val Val Leu Val Gly
 85 90 95

<210> 62
 <211> 96
 <212> PRT
 <213> Hepatitis C virus

<400> 62
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 20 25 30
 Cys Asn Gly Phe Leu Tyr Phe Val Ile Phe Phe Val Ala Ala Trp Tyr
 35 40 45
 Ile Lys Gly Arg Val Val Pro Leu Ala Thr Tyr Ser Leu Thr Gly Leu
 50 55 60
 Trp Ser Phe Ser Leu Leu Leu Leu Ala Leu Pro Gln Gln Ala Tyr Ala
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 Leu Asp Thr Glu Val Ala Ala Ser Cys Gly Gly Val Val Leu Val Gly
 85 90 95

<210> 63
 <211> 96
 <212> PRT
 <213> Hepatitis C virus

<400> 63
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 35 40 45
 Leu Lys Gly Arg Trp Val Pro Gly Ala Val Tyr Ala Leu Tyr Gly Met
 50 55 60
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 Leu Asp Thr Glu Val Ala Ala Ser Cys Gly Gly Val Val Leu Val Gly
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<210> 64
 <211> 96

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<212> PRT
<213> Hepatitis C virus

<400> 64
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20 25 30
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35 40 45
Ile Lys Gly Arg Val Val Pro Leu Ala Thr Tyr Ser Leu Thr Gly Leu
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65 70 75 80
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<210> 65
<211> 96
<212> PRT
<213> Hepatitis C virus

<400> 65
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Thr His Gly Leu Val Ser Phe Leu Val Phe Phe Cys Phe Ala Trp Tyr
35 40 45
Leu Lys Gly Arg Trp Val Pro Gly Ala Val Tyr Ala Leu Tyr Gly Met
50 55 60
Trp Pro Leu Leu Leu Leu Leu Leu Ala Leu Pro Gln Arg Ala Tyr Ala
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Leu Asp Thr Glu Val Ala Ala Ser Cys Gly Gly Val Val Leu Val Gly
85 90 95

<210> 66
<211> 96
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<213> Hepatitis C virus

<400> 66
Arg Val Cys Ala Cys Leu Trp Met Leu Ile Leu Leu Gly Gln Ala Glu
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Cys Asn Gly Phe Leu Tyr Phe Val Ile Phe Phe Val Ala Ala Trp Tyr
35 40 45
Ile Lys Gly Arg Val Val Pro Leu Ala Thr Tyr Ser Leu Thr Gly Leu
50 55 60
Trp Ser Phe Ser Leu Leu Leu Leu Ala Leu Pro Gln Gln Ala Tyr Ala
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<210> 67
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<212> DNA
<213> Hepatitis C virus

<400> 67

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 <211> 3011
 <212> PRT
 <213> Hepatitis C Virus

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35     40     45
Thr Arg Lys Thr Ser Glu Arg Ser Gln Pro Arg Gly Arg Arg Gln Pro
50     55     60
Ile Pro Lys Ala Arg Arg Pro Glu Gly Arg Thr Trp Ala Gln Pro Gly
65     70     75     80
Tyr Pro Trp Pro Leu Tyr Gly Asn Glu Gly Cys Gly Trp Ala Gly Trp
85     90     95
Leu Leu Ser Pro Arg Gly Ser Arg Pro Ser Trp Gly Pro Thr Asp Pro
100    105    110
Arg Arg Arg Ser Arg Asn Leu Gly Lys Val Ile Asp Thr Leu Thr Cys
115    120    125
Gly Phe Ala Asp Leu Met Gly Tyr Ile Pro Leu Val Gly Ala Pro Leu
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Gly Gly Ala Ala Arg Ala Leu Ala His Gly Val Arg Val Leu Glu Asp
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 Leu Leu Phe Leu Leu Leu Ala Asp Ala Arg Val Cys Ser Cys Leu Trp
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Ala	Lys	Val	Leu	Ile	Val	Ala	Leu	Leu	Phe	Ala	Gly	Val	Asp	Gly	Glu
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Thr	His	Thr	Thr	Gly	Arg	Val	Val	Gly	Arg	Thr	Thr	Ser	Gly	Phe	Thr
385					390					395				400	
Ser	Leu	Phe	Ser	Ser	Gly	Ala	Ser	Gln	Lys	Ile	Gln	Leu	Val	Asn	Thr
				405					410					415	
Asn	Gly	Ser	Trp	His	Ile	Asn	Arg	Thr	Ala	Leu	Asn	Cys	Asn	Asp	Ser
			420					425					430		
Leu	Gln	Thr	Gly	Phe	Leu	Ala	Ala	Leu	Phe	Tyr	Thr	His	Lys	Phe	Asn
		435					440					445			
Ser	Pro	Gly	Cys	Pro	Glu	Arg	Met	Ala	Ser	Cys	Arg	Pro	Ile	Asp	Trp
	450					455					460				
Phe	Ala	Gln	Gly	Trp	Gly	Pro	Ile	Thr	Tyr	Thr	Glu	Pro	Asn	Ser	Ser
465					470					475					480
Asp	Gln	Arg	Pro	Tyr	Cys	Trp	His	Tyr	Ala	Pro	Arg	Pro	Cys	Gly	Ile
				485					490					495	
Val	Pro	Ala	Ser	Gln	Val	Cys	Gly	Pro	Val	Tyr	Cys	Phe	Thr	Pro	Ser
			500					505					510		
Pro	Val	Val	Val	Gly	Thr	Thr	Asp	Arg	Ser	Gly	Val	Pro	Thr	Tyr	Ser
		515					520					525			
Trp	Gly	Glu	Asn	Glu	Thr	Asp	Val	Met	Leu	Leu	Asn	Asn	Thr	Arg	Pro
	530					535					540				
Pro	Gln	Gly	Asn	Trp	Phe	Gly	Cys	Thr	Trp	Met	Asn	Ser	Thr	Gly	Phe
545					550					555					560
Thr	Lys	Thr	Cys	Gly	Gly	Pro	Pro	Cys	Asn	Ile	Gly	Gly	Val	Gly	Asn
				565					570					575	
Arg	Thr	Leu	Ile	Cys	Pro	Thr	Asp	Cys	Phe	Arg	Lys	His	Pro	Glu	Ala
			580					585					590		
Thr	Tyr	Thr	Lys	Cys	Gly	Ser	Gly	Pro	Trp	Leu	Thr	Pro	Arg	Cys	Leu
		595					600					605			
Val	Asp	Tyr	Pro	Tyr	Arg	Leu	Trp	His	Tyr	Pro	Cys	Thr	Leu	Asn	Phe
	610					615					620				
Ser	Ile	Phe	Lys	Val	Arg	Met	Tyr	Val	Gly	Gly	Val	Glu	His	Arg	Leu
625					630					635					640
Asn	Ala	Ala	Cys	Asn</											

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Gly Ala Ala Tyr Ala Phe Tyr Gly Val Trp Pro Leu Leu Leu Leu Leu
 785 790 795 800
 Leu Ala Leu Pro Pro Arg Ala Tyr Ala Leu Asp Arg Glu Met Ala Ala
 805 810 815
 Ser Cys Gly Gly Ala Val Leu Val Gly Leu Val Phe Leu Thr Leu Ser
 820 825 830
 Pro Tyr Tyr Lys Val Phe Leu Thr Arg Leu Ile Trp Trp Leu Gln Tyr
 835 840 845
 Phe Ile Thr Arg Ala Glu Ala His Met Gln Val Trp Val Pro Pro Leu
 850 855 860
 Asn Val Arg Gly Gly Arg Asp Ala Ile Ile Leu Leu Thr Cys Ala Val
 865 870 875 880
 His Pro Glu Leu Ile Phe Asp Ile Thr Lys Leu Leu Leu Ala Ile Leu
 885 890 895
 Gly Pro Leu Met Val Leu Gln Ala Gly Ile Thr Arg Val Pro Tyr Phe
 900 905 910
 Val Arg Ala Gln Gly Leu Ile Arg Ala Cys Met Leu Val Arg Lys Val
 915 920 925
 Ala Gly Gly His Tyr Val Gln Met Ala Phe Met Lys Leu Gly Ala Leu
 930 935 940
 Thr Gly Thr Tyr Val Tyr Asn His Leu Thr Pro Leu Arg Asp Trp Ala
 945 950 955 960
 His Ala Gly Leu Arg Asp Leu Ala Val Ala Val Glu Pro Val Val Phe
 965 970 975
 Ser Ala Met Glu Thr Lys Val Ile Thr Trp Gly Ala Asp Thr Ala Ala
 980 985 990
 Cys Gly Asp Ile Ile Leu Gly Leu Pro Val Ser Ala Arg Arg Gly Lys
 995 1000 1005
 Glu Ile Phe Leu Gly Pro Ala Asp Ser Leu Glu Gly Gln Gly Trp Arg
 1010 1015 1020
 Leu Leu Ala Pro Ile Thr Ala Tyr Ser Gln Gln Thr Arg Gly Val Leu
 1025 1030 1035 1040
 Gly Cys Val Ile Thr Ser Leu Thr Gly Arg Asp Lys Asn Gln Val Glu
 1045 1050 1055
 Gly Glu Val Gln Val Val Ser Thr Ala Thr Gln Ser Phe Leu Ala Thr
 1060 1065 1070
 Cys Ile Asn Gly Val Cys Trp Thr Val Tyr His Gly Ala Gly Ser Lys
 1075 1080 1085
 Thr Leu Ala Gly Pro Lys Gly Pro Ile Thr Gln Met Tyr Thr Asn Val
 1090 1095 1100
 Asp Leu Asp Leu Val Gly Trp Gln Ala Pro Pro Gly Ala Arg Ser Met
 1105 1110 1115 1120
 Thr Pro Cys Ser Cys Gly Ser Ser Asp Leu Tyr Leu Val Thr Arg His
 1125 1130 1135
 Ala Asp Val Ile Pro Val Arg Arg Arg Gly Asp Ser Arg Gly Ser Leu
 1140 1145 1150
 Leu Ser Pro Arg Pro Val Ser Tyr Leu Lys Gly Ser Ser Gly Gly Pro
 1155 1160 1165
 Leu Leu Cys Pro Ser Gly His Val Val Gly Val Phe Arg Ala Ala Val
 1170 1175 1180
 Cys Thr Arg Gly Val Ala Lys Ala Val Asp Phe Ile Pro Val Glu Ser
 1185 1190 1195 1200
 Met Glu Thr Thr Met Arg Ser Pro Val Phe Thr Asp Asn Ser Ser Pro
 1205 1210 1215
 Pro Ala Val Pro Gln Thr Phe Gln Val Ala His Leu His Ala Pro Thr
 1220 1225 1230
 Gly Ser Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr Ala Ala Gln Gly
 1235 1240 1245
 Tyr Lys Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe
 1250 1255 1260
 Gly Ala Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr
 1265 1270 1275 1280
 Gly Val Arg Thr Ile Thr Thr Gly Gly Ser Ile Thr Tyr Ser Thr Tyr

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Gly Lys Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile
 Ile Ile Cys Asp Glu Cys His Ser Thr Asp Ser Thr Thr Ile Leu Gly
 Ile Gly Thr Val Leu Asp Gln Ala Glu Thr Ala Gly Ala Arg Leu Val
 Val Leu Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro
 Asn Ile Glu Glu Ile Gly Leu Ser Asn Asn Gly Glu Ile Pro Phe Tyr
 Gly Lys Ala Ile Pro Ile Glu Ala Ile Lys Gly Gly Arg His Leu Ile
 Phe Cys His Ser Lys Lys Lys Cys Asp Glu Leu Ala Ala Lys Leu Thr
 Gly Leu Gly Leu Asn Ala Val Ala Tyr Tyr Arg Gly Leu Asp Val Ser
 Val Ile Pro Pro Ile Gly Asp Val Val Val Val Ala Thr Asp Ala Leu
 Met Thr Gly Phe Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr
 Cys Val Thr Gln Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile
 Glu Thr Thr Thr Val Pro Gln Asp Ala Val Ser Arg Ser Gln Arg Arg
 Gly Arg Thr Gly Arg Gly Arg Ser Gly Ile Tyr Arg Phe Val Thr Pro
 Gly Glu Arg Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys
 Tyr Asp Ala Gly Cys Ala Trp His Glu Leu Thr Pro Ala Glu Thr Ser
 Val Arg Leu Arg Ala Tyr Leu Asn Thr Pro Gly Leu Pro Val Cys Gln
 Asp His Leu Glu Phe Trp Glu Ser Val Phe Thr Gly Leu Thr His Ile
 Asp Ala His Phe Leu Ser Gln Thr Lys Gln Ala Gly Asp Asn Phe Pro
 Tyr Leu Val Ala Tyr Gln Ala Thr Val Cys Ala Arg Ala Gln Ala Pro
 Pro Pro Ser Trp Asp Gln Met Trp Lys Cys Leu Ile Arg Leu Lys Pro
 Thr Leu His Gly Pro Thr Pro Leu Leu Tyr Arg Leu Gly Ala Val Gln
 Asn Glu Val Ile Leu Thr His Pro Ile Thr Lys Tyr Ile Met Ala Cys
 Met Ser Ala Asp Leu Glu Val Val Thr Ser Thr Trp Val Leu Val Gly
 Gly Val Leu Ala Ala Leu Ala Ala Tyr Cys Leu Thr Thr Gly Ser Val
 Val Ile Val Gly Arg Ile Ile Leu Ser Gly Lys Pro Ala Val Val Pro
 Asp Arg Glu Val Leu Tyr Gln Glu Phe Asp Glu Met Glu Glu Cys Ala
 Ser Gln Leu Pro Tyr Ile Glu Gln Gly Met Gln Leu Ala Glu Gln Phe
 Lys Gln Lys Ala Leu Gly Leu Leu Gln Thr Ala Thr Lys Gln Ala Glu
 Ala Ala Ala Pro Val Val Glu Ser Lys Trp Arg Ala Leu Glu Thr Phe
 Trp Ala Lys His Met Trp Asn Phe Ile Ser Gly Ile Gln Tyr Leu Ala
 Gly Leu Ser Thr Leu Pro Gly Asn Pro Ala Ile Ala Ser Leu Met Ala

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Phe Thr Ala Ser Ile Thr Ser Pro Leu Thr Thr Gln Asn Thr Leu Leu
 1795 1800 1805
 Phe Asn Ile Leu Gly Gly Trp Val Ala Ala Gln Leu Ala Pro Pro Ser
 1810 1815 1820
 Ala Ala Ser Ala Phe Val Gly Ala Gly Ile Ala Gly Ala Ala Val Gly
 1825 1830 1835 1840
 Ser Ile Gly Leu Gly Lys Val Leu Val Asp Ile Leu Ala Gly Tyr Gly
 1845 1850 1855
 Ala Gly Val Ala Gly Ala Leu Val Ala Phe Lys Val Met Ser Gly Glu
 1860 1865 1870
 Val Pro Ser Thr Glu Asp Leu Val Asn Leu Leu Pro Ala Ile Leu Ser
 1875 1880 1885
 Pro Gly Ala Leu Val Val Gly Val Val Cys Ala Ala Ile Leu Arg Arg
 1890 1895 1900
 His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met Asn Arg Leu Ile
 1905 1910 1915 1920
 Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr His Tyr Val Pro
 1925 1930 1935
 Glu Ser Asp Ala Ala Ala Arg Val Thr Gln Ile Leu Pro Ser Leu Thr
 1940 1945 1950
 Ile Thr Gln Leu Leu Lys Arg Leu His Gln Trp Ile Asn Glu Asp Cys
 1955 1960 1965
 Ser Thr Pro Cys Ser Gly Ser Trp Leu Arg Asp Val Trp Asp Trp Ile
 1970 1975 1980
 Cys Thr Val Leu Thr Asp Phe Lys Thr Trp Leu Gln Ser Lys Leu Leu
 1985 1990 1995 2000
 Pro Arg Leu Pro Gly Val Pro Phe Leu Ser Cys Gln Arg Gly Tyr Lys
 2005 2010 2015
 Gly Val Trp Arg Gly Asp Gly Ile Met Gln Thr Thr Cys Pro Cys Gly
 2020 2025 2030
 Ala Gln Ile Ala Gly His Val Lys Asn Gly Ser Met Arg Ile Val Gly
 2035 2040 2045
 Pro Arg Thr Cys Ser Asn Thr Trp His Gly Thr Phe Pro Ile Asn Ala
 2050 2055 2060
 Tyr Thr Thr Gly Pro Cys Thr Pro Ser Pro Ala Pro Asn Tyr Ser Arg
 2065 2070 2075 2080
 Ala Leu Trp Arg Val Ala Ala Glu Glu Tyr Val Glu Val Thr Arg Val
 2085 2090 2095
 Gly Asp Phe His Tyr Val Thr Gly Met Thr Thr Asp Asn Val Lys Cys
 2100 2105 2110
 Pro Cys Gln Val Pro Ala Pro Glu Phe Phe Thr Glu Val Asp Gly Val
 2115 2120 2125
 Arg Leu His Arg Tyr Ala Pro Ala Cys Arg Pro Leu Leu Arg Glu Asp
 2130 2135 2140
 Val Thr Phe Gln Val Gly Leu Asn Gln Tyr Leu Val Gly Ser Gln Leu
 2145 2150 2155 2160
 Pro Cys Glu Pro Glu Pro Asp Val Thr Val Leu Thr Ser Met Leu Thr
 2165 2170 2175
 Asp Pro Ser His Ile Thr Ala Glu Thr Ala Lys Arg Arg Leu Ala Arg
 2180 2185 2190
 Gly Ser Pro Pro Ser Leu Ala Ser Ser Ser Ala Ser Gln Leu Ser Ala
 2195 2200 2205
 Pro Ser Leu Lys Ala Thr Cys Thr Thr His His Asp Ser Pro Asp Ala
 2210 2215 2220
 Asp Leu Ile Glu Ala Asn Leu Leu Trp Arg Gln Glu Met Gly Gly Asn
 2225 2230 2235 2240
 Ile Thr Arg Val Glu Ser Glu Asn Lys Val Val Ile Leu Asp Ser Phe
 2245 2250 2255
 Glu Pro Leu His Ala Glu Gly Asp Glu Arg Glu Ile Ser Val Ala Ala
 2260 2265 2270
 Glu Ile Leu Arg Lys Ser Arg Lys Phe Pro Ser Ala Leu Pro Ile Trp
 2275 2280 2285
 Ala Arg Pro Asp Tyr Asn Pro Pro Leu Leu Glu Ser Trp Lys Asp Pro

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2290 2295 2300
 Asp Tyr Val Pro Pro Val Val His Gly Cys Pro Leu Pro Pro Thr Lys
 2305 2310 2315 2320
 Ala Pro Pro Ile Pro Pro Arg Arg Lys Arg Thr Val Val Leu Thr
 2325 2330 2335
 Glu Ser Asn Val Ser Ser Ala Leu Ala Glu Leu Ala Thr Lys Thr Phe
 2340 2345 2350
 Gly Ser Ser Gly Ser Ser Ala Val Asp Ser Gly Thr Ala Thr Ala Leu
 2355 2360 2365
 Pro Asp Leu Ala Ser Asp Asp Gly Asp Lys Gly Ser Asp Val Glu Ser
 2370 2375 2380
 His Ser Ser Met Pro Pro Leu Glu Gly Glu Pro Gly Asp Pro Asp Leu
 2385 2390 2400
 Ser Asp Gly Ser Trp Ser Thr Val Ser Glu Glu Ala Ser Glu Asp Val
 2405 2410 2415
 Val Cys Cys Ser Met Ser Tyr Thr Trp Thr Gly Ala Leu Ile Thr Pro
 2420 2425 2430
 Cys Ala Ala Glu Glu Ser Lys Leu Pro Ile Asn Pro Leu Ser Asn Ser
 2435 2440 2445
 Leu Leu Arg His His Asn Met Val Tyr Ala Thr Thr Ser Arg Ser Ala
 2450 2455 2460
 Ser Leu Arg Gln Lys Lys Val Thr Phe Asp Arg Leu Gln Val Leu Asp
 2465 2470 2475 2480
 Asp His Tyr Arg Asp Val Leu Lys Glu Met Lys Ala Lys Ala Ser Thr
 2485 2490 2495
 Val Lys Ala Lys Leu Leu Ser Ile Glu Glu Ala Cys Lys Leu Thr Pro
 2500 2505 2510
 Pro His Ser Ala Lys Ser Lys Phe Gly Tyr Gly Ala Lys Asp Val Arg
 2515 2520 2525
 Asn Leu Ser Ser Arg Ala Val Asn His Ile Arg Ser Val Trp Glu Asp
 2530 2535 2540
 Leu Leu Glu Asp Thr Glu Thr Pro Ile Asp Thr Thr Ile Met Ala Lys
 2545 2550 2555 2560
 Ser Glu Val Phe Cys Val Gln Pro Glu Lys Gly Gly Arg Lys Pro Ala
 2565 2570 2575
 Arg Leu Ile Val Phe Pro Asp Leu Gly Val Arg Val Cys Glu Lys Met
 2580 2585 2590
 Ala Leu Tyr Asp Val Val Ser Thr Leu Pro Gln Ala Val Met Gly Ser
 2595 2600 2605
 Ser Tyr Gly Phe Gln Tyr Ser Pro Lys Gln Arg Val Glu Phe Leu Val
 2610 2615 2620
 Asn Thr Trp Lys Ser Lys Lys Cys Pro Met Gly Phe Ser Tyr Asp Thr
 2625 2630 2635 2640
 Arg Cys Phe Asp Ser Thr Val Thr Glu Ser Asp Ile Arg Val Glu Glu
 2645 2650 2655
 Ser Ile Tyr Gln Cys Cys Asp Leu Ala Pro Glu Ala Arg Gln Ala Ile
 2660 2665 2670
 Arg Ser Leu Thr Glu Arg Leu Tyr Ile Gly Gly Pro Leu Thr Asn Ser
 2675 2680 2685
 Lys Gly Gln Asn Cys Gly Tyr Arg Arg Cys Arg Ala Ser Gly Val Leu
 2690 2695 2700
 Thr Thr Ser Cys Gly Asn Thr Leu Thr Cys Tyr Leu Lys Ala Thr Ala
 2705 2710 2715 2720
 Ala Cys Arg Ala Ala Lys Leu Gln Asp Cys Thr Met Leu Val Asn Gly
 2725 2730 2735
 Asp Asp Leu Val Val Ile Cys Glu Ser Ala Gly Thr Gln Glu Asp Ala
 2740 2745 2750
 Ala Ala Leu Arg Ala Phe Thr Glu Ala Met Thr Arg Tyr Ser Ala Pro
 2755 2760 2765
 Pro Gly Asp Pro Pro Gln Pro Glu Tyr Asp Leu Glu Leu Ile Thr Ser
 2770 2775 2780
 Cys Ser Ser Asn Val Ser Val Ala His Asp Ala Ser Gly Lys Arg Val
 2785 2790 2795 2800

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Tyr Tyr Leu Thr Arg Asp Pro Thr Thr Pro Leu Ala Arg Ala Ala Trp
 2805 2810 2815
 Glu Thr Ala Arg His Thr Pro Ile Asn Ser Trp Leu Gly Asn Ile Ile
 2820 2825 2830
 Met Tyr Ala Pro Thr Leu Trp Ala Arg Met Ile Leu Met Thr His Phe
 2835 2840 2845
 Phe Ser Ile Leu Leu Ala Gln Glu Gln Leu Glu Lys Ala Leu Asp Cys
 2850 2855 2860
 Gln Ile Tyr Gly Ala Cys Tyr Ser Ile Glu Pro Leu Asp Leu Pro Gln
 2865 2870 2875 2880
 Ile Ile Glu Arg Leu His Gly Leu Ser Ala Phe Thr Leu His Ser Tyr
 2885 2890 2895
 Ser Pro Gly Glu Ile Asn Arg Val Ala Ser Cys Leu Arg Lys Leu Gly
 2900 2905 2910
 Val Pro Pro Leu Arg Thr Trp Arg His Arg Ala Arg Ser Val Arg Ala
 2915 2920 2925
 Lys Leu Leu Ser Gln Gly Gly Arg Ala Ala Thr Cys Gly Arg Tyr Leu
 2930 2935 2940
 Phe Asn Trp Ala Val Arg Thr Lys Leu Lys Leu Thr Pro Ile Pro Ala
 2945 2950 2955 2960
 Ala Ser Gln Leu Asp Leu Ser Gly Trp Phe Val Ala Gly Tyr Ser Gly
 2965 2970 2975
 Gly Asp Ile Tyr His Ser Leu Ser Arg Ala Arg Pro Arg Trp Phe Pro
 2980 2985 2990
 Leu Cys Leu Leu Leu Leu Ser Val Gly Val Gly Ile Tyr Leu Leu Pro
 2995 3000 3005
 Asn Arg
 3010